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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
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Per H. Hammarlund

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EXAMINER

PEUGH, BRIAN R

ART UNIT

PAPER NUMBER

2187

MAIL DATE

DELIVERY MODE

08/22/2008

PAPER

Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Office Action Summary	Application No. 10/743,142	Applicant(s) HAMMARLUND ET AL.	
	Examiner Brian R. Peugh	Art Unit 2187	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 09 June 2008.
- 2a) ☒ This action is **FINAL**. 2b) ☐ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1,3-11 and 13-18 is/are pending in the application.
- 4a) Of the above claim(s) _____ is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 1,3-11, 13-18 is/are rejected.
- 7) ☐ Claim(s) _____ is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on _____ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some * c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
 2. ☐ Certified copies of the priority documents have been received in Application No. _____.
 3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- | | |
|--|---|
| 1) <input type="checkbox"/> Notice of References Cited (PTO-892) | 4) <input type="checkbox"/> Interview Summary (PTO-413) |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948) | Paper No(s)/Mail Date. _____ |
| 3) <input type="checkbox"/> Information Disclosure Statement(s) (PTO/SB/08) | 5) <input type="checkbox"/> Notice of Informal Patent Application |
| Paper No(s)/Mail Date _____ | 6) <input type="checkbox"/> Other: _____ |

Response to Amendment

This Office Action is in response to applicant's communication filed June 9, 2008 in response to PTO Office Action dated January 9, 2008. The applicant's remarks and amendment to the specification and/or claims were considered with the results that follow.

Claims 1, 3-11, and 13-18 have been presented for examination in this application.

Claim Rejections - 35 USC § 103

1. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

2. Claims 1, 3-11, and 13-18 are rejected under 35 U.S.C. 103(a) as being unpatentable over Favor (US# 6,732,236) in view of Frederick, Jr. et al. (US# 6,336,168).

As per claims 1, 3, and 4, Favor discloses a method comprising: executing a first instruction in a processor; if the execution of the first instruction generates a cache miss, associating the first instruction with the cache miss; enqueueing the first instruction for re-execution;... and after the cache miss with which the first instruction is associated is serviced, re-executing the first instruction, the method further comprising associating

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the cache miss with a second instruction dependent on the first instruction, assigning an identifier to the cache miss and determining a priority of the instruction **[an access request involved in a cache miss, storing the cache miss in a retry queue while the cache fill is pending, detecting the return of the cache fill and inserting the access request associated with the cache miss for processing (column 1, lines 53-59); in the case of cache miss, the access request is transmitted to retrieve the requested data back to the cache (column 2, lines 32-35); if the address lookup determines that no matching is found indicating a cache miss, then the address lookup forward a cache fill request to the cache request queue (column 3, lines 23-26); the address tag is a seven bits and identifies the retry request queue (RRQ) entry with its associated cache line (column 4, lines 6-14); RRQ control logic compares the seven bit address tag to the entries located in the RRQ and changes the retry bit from ineligible to eligible for matching entries so the eligible retry can be inserted into arbitration module (column 4, lines 40-60)].**

The difference between the claimed subject matter and that of Favor is that Claim 1 recites enqueueing the second instruction for execution and executing the second instruction. Frederick, Jr. et al.. teaches merging multiple miss transactions together, in that a second instruction dependent on a first instruction [a second load instruction is associated with the first load instruction that has missed previously], the second instruction is enqueued [via the merging of the second instruction with the first instruction], and executed when the data needed for the first and second instructions is available [abs.; col. 4, line 34 – col. 5, line 35].

Therefore it would have been obvious to one of ordinary skill in the art having the teachings of Favor and Frederick, Jr. et al. before them at the time of the invention to modify the system of Favor to include the miss merging of Frederick, Jr. et al., because then a performance advantage related to the time required for data availability may be gained [col. 5, lines 45-50].

As per claims 5-11 and 13-18, claims 5-11 and 13-18 encompass the same scope of the invention as those of claims 1, 3, and 4 in addition of a processor and a system having means for performing the method of claims 1, 3, and 4. Therefore, claims 5-11 and 13-18 are rejected for the same reasons as stated above with respect to claims 1, 3, and 4.

Response to Arguments

Applicant's arguments filed June 9, 2008 have been fully considered but they are not persuasive.

Applicant's have argued on page 8 of the response, in regards to the Frederick et al. reference that

“...the cited reference does not address to or relate to dependent instructions at all. Instead, the cited reference (including the cited portion) relate to a second load instruction that is requesting data in the same cache line addressed by a first instruction....Applicants submit the cited reference is directed two independent instructions that are referencing the same cache line; not a first instruction and a second instruction dependent on the first instruction as specifically recited in independent claim 1.”

The Examiner respectfully disagrees. Using a broad a reasonable interpretation of the claim language in question, that of "...associating the cache miss with a second instruction dependent on the first instruction;", a number of interpretations can be made. A first interpretation would be in accordance with Applicant's Specification, where the second instruction is part of a subset of instructions that are dependent on the first instruction. Another interpretation, that which has been taken by the Examiner, is that the second instruction has become dependent upon the first instruction after the first instruction has caused a miss, and that miss has been associated with the second instruction. Column 4, lines 46-49 of the Frederick et al. reference teaches that the second load instruction is requesting data in the same cache line addressed, and missed, by the first load instruction [first load instruction miss, col. 4, lines 34-38]. The data requested by the second load instruction is also not available at the time of the first load instruction's miss, as seen in column 4, lines 51-54:

In step 302, it will be determined that the cache line requested by the second load instruction is not within the L1 data cache 236, because the cache line was not available to the first load instruction

If the data corresponding to the first load instruction's miss has not been returned, the second load instruction is merged into the load miss queue entry correspond to the first load instruction [col. 5, lines 9-12]. Therefore, since the first load instruction missed and required the return of a cache line, where said cache line is required to fulfill the second load instruction, and said cache line is not yet in the L1 data cache at the time of the second load instruction, the fulfillment and execution of the second load instruction is

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dependent upon the completion and return of the cache line requested by the first load instruction. Thus, when the requested cache line initially associated with first load instruction is returned and available, the second load instruction will be able to be executed and fulfilled. In accordance with this interpretation, the Examiner believes that the Frederick et al. reference teaches the claim limitations as recited.

Conclusion

THIS ACTION IS MADE FINAL. Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the mailing date of this final action.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Brian R. Peugh whose telephone number is (571) 272-4199. The examiner can normally be reached on Monday-Thursday from 7:00am to 4:30pm. The examiner can also be reached on alternate Friday's from 7:00am to 4:30pm.

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If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Donald Sparks, can be reached on (571) 272-4201. The fax phone number for the organization where this application or proceeding is assigned is 703-872-9306.

Any inquiry of a general nature or relating to the status of this application or proceeding should be directed to the receptionist whose telephone number is 571-272-2100.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

/Brian R. Peugh/
Primary Examiner, Art Unit 2187
8/19/08